WE CLAIM

1. An optical system for detecting one or more optical responses of biological tissue, said optical system comprising:

(a) a photonic energy source for emitting electromagnetic radiation;

(b) an optical emission processing means for receiving the electromagnetic radiation from the photonic energy source and isolating one or more illumination wavelengths of the electromagnetic radiation, said optical emission processing means encoding the one or more illumination wavelengths using one or more pseudo random codewords or linear FM thereby generating an encoded signal, the optical emission processing means transmitting the encoded signal to the biological tissue;

(c) an optics assembly providing a means for aligning emitter optics of the optical emission processing means with detector optics of a received light optical processing means;

(d) a received light optical processing means for collecting and isolating one or more wavelengths of received electromagnetic radiation from the biological tissue created in response to the encoded signal and transmitting the one or more wavelengths of received electromagnetic radiation to an optical detector;

(e) an optical detector for sensing and converting the one or more wavelengths of received electromagnetic radiation into an electrical signal; and

(f) digital signal processing means for correlating the electrical signal received from the optical detector with the encoded signal thereby identifying an optical response of the biological tissue to the one or more illumination wavelengths, said digital signal processing means controlling the functionality of the photonic energy source, the optical emission processing means and the received light optical processing means.

2. The system for detecting optical characteristics of biological tissue according to claim 1, wherein the digital signal processing means is a circuit board which is integrated into a computing system.

3. The system for detecting optical characteristics of biological tissue according to claim 1, wherein the photonic energy source is selected from the group comprising a laser, a laser diode, a light emitting diode, an arc flashlamp or a continuous wave bulb.

4. The system for detecting optical characteristics of biological tissue according to claim 1, wherein optical emission processing means and the received light optical processing means include one or more optical devices selected from the group comprising condensers, focusing devices, lenses, fibre optics, apertures and monochromators.

5. The system for detecting optical characteristics of biological tissue according to claim 1, wherein the optical detector is selected from the group comprising a gallium-arsenide photodiode, a cadmium sulfide photodiode or a silicon avalanche diode.

6. Use of an optical system for generating a pattern of optical characteristics of biological tissue, said optical characteristics being reflectance and fluorescence characteristics of the illuminated biological tissue, said optical system comprising:

(a) a photonic energy source for emitting electromagnetic radiation;

(b) an optical emission processing means for receiving the electromagnetic radiation from the photonic energy source and isolating one or more illumination wavelengths of the electromagnetic radiation, said optical emission processing means encoding the one or more illumination wavelengths using one or more pseudo random codewords or linear FM thereby generating an encoded signal, the optical emission processing means transmitting the encoded signal to the biological tissue;

(c) an optics assembly providing a means for aligning emitter optics of the optical emission processing means with detector optics of a received light optical processing means;

(d) a received light optical processing means for collecting and isolating one or more wavelengths of received electromagnetic radiation from the

biological tissue created in response to the encoded signal and transmitting the one or more wavelengths of received electromagnetic radiation to an optical detector;

(e) an optical detector for sensing and converting the one or more wavelengths of received electromagnetic radiation into an electrical signal; and

(f) digital signal processing means for correlating the electrical signal received from the optical detector with the encoded signal thereby identifying an optical response of the biological tissue to the one or more illumination wavelengths, said digital signal processing means controlling the functionality of the photonic energy source, the optical emission processing means and the received light optical processing means.

7. A method for detecting one or more optical responses of biological tissue and creating a pattern of the one or more optical responses, said method comprising the steps of:

(a) generating one or more illumination wavelengths of electromagnetic radiation;

(b) encoding said one or more illumination wavelengths using one or more pseudo random codewords or linear FM thereby generating an encoded signal;

(c) illuminating the biological tissue with the encoded signal, in order to generate encoded reflectance and fluorescence from the biological tissue in response thereto;

(d) collecting said encoded reflectance and fluorescence;

(e) correlating said encoded reflectance and fluorescence with the encoded signal thereby identifying one or more optical responses to the one or more illumination wavelengths;

(f) repeating steps a) through e) for a next one or more wavelengths of electromagnetic radiation;

(g) generating a pattern of the one or more optical responses, said pattern being a representation of a particular one or more optical responses matched with a particular one or more illumination wavelengths.

8. The method for detecting one or more optical responses of biological tissue according to claim 7, wherein the pattern is a contour map, and a position on the contour map is represented by an illumination wavelength and a detection wavelength and intensity of the collected reflectance and fluorescence is represented by contours.

9. The method for detecting one or more optical responses of biological tissue according to claim 7, wherein the pattern is a comparative pattern between detected optical responses of two biological tissue samples, said comparative pattern identifying optical response differences between the two biological tissue samples.

10. The method for detecting one or more optical responses of biological tissue according to claim 7, wherein the pattern is a three dimensional representation of the collected reflectance and fluorescence.

11. The method for detecting one or more optical responses of biological tissue and creating a pattern of the one or more optical responses according to claim 7, wherein the optical characteristics of biomarkers within the biological tissue are determined.

12. The method for detecting one or more optical responses of biological tissue according to claim 7, further comprising the step of determining a statistical significance value related to each of the one or more optical responses, said statistical significance value representative of a ratio of signal-to-noise determined during detection.

13. The method for detecting one or more optical characteristics responses of biological tissue according to claim 7, wherein the pattern is a comparative pattern between detected optical responses of an identical location of the biological tissue sample detected at different points in time, said comparative pattern identifying optical response differences of the biological tissue sample over time.

14. The method for detecting one or more optical characteristics responses of biological tissue according to claim 7, wherein the pattern is a comparative pattern between detected optical responses of two or more different locations of the biological tissue sample, said comparative pattern identifying optical response differences of the two or more different locations of the biological tissue sample.